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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/690,999	10/22/2003	Sheng-Wei Yang	10113091	5671

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EXAMINER

GOUDREAU, GEORGE A

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 09/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/690,999	Applicant(s) YANG ET AL.	
	Examiner George A. Goudreau	Art Unit 1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

George A. Goudreau
GEORGE GOUDREAU
PRIMARY EXAMINER
9-20-04

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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1. Claims 1-29 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

-The wording used in claims 1, and 16 is written in a confusing manner, and should be reworded. (i.e.-In claims 1, and 16, applicant recites that the first oxide layer is etched until it is lowered to the surface of opening in the trench. The figures used to illustrate applicant's claimed invention, show that the first dielectric layer is actually etched until it is lowered below the opening in the trench. The examiner cannot tell what applicant is trying to claim. The figures which are used to illustrate applicant's claimed invention, show the first dielectric is etched below the opening in the trench while the claims recite that the first dielectric is etched to the opening in the trench.);

-The wording used in claims 7, 9, 21, and 23 is very confusing, and should be reworded. (The usage of the term "...in order...");

-There should be no period in the middle of a sentence in claim 8.; and

-The wording used in claims 8, and 22 is very confusing, and should be reworded. (The phrase "...lowered about 100-1000 angstrom..." in claims 8, and 22 is confusing.)

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2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1, 5, 7, 10, and 12 –14 are rejected under 35 U.S.C. 102(e) as being anticipated by En-Ho et. al. (2003/0143852).

En-Ho et. al. disclose a process for forming an STI structure which is comprised of the following steps:

- A Si₃N₄ (104)/SiO₂ laminate pad layers are formed onto the surface of the Si wafer (100).;
- A STI trench (108) is etched through the pad layers, and the top portion of the surface of the Si wafer using a patterned photo resist etch mask.;
- A liner oxide layer (101) is formed inside the trench using a thermal oxidation process.;
- A first oxide layer (112) is grown inside the STI trench as well as on the surface of the wafer using TEOS in a LPCVD process.;
- The first oxide layer is etched below the surface of the STI trench using an HF wet etching step.;

- A second oxide layer is grown inside the STI trench as well as on the surface of the wafer using TEOS in an HDPCVD process.;

- The oxide layers are thermally annealed.; and

- The oxide layers are planarized using a cmp polishing process.

This is discussed specifically on pages 1-3. This is shown in figures 1-2.

4. Claims 1, and 1-10 are rejected under 35 U.S.C. 102(b) as being anticipated by Kim (6,339,004).

Kim discloses a process for forming an STI structure which is comprised of the following steps:

- A photo resist etch mask (12) is used in the patterning of a Si wafer (11) to form an STI trench.;

- A thermal oxide layer (13) is grown in the inside walls of the STI trench.;

- A Si₃N₄ layer (14) is grown on the surface of the oxide layer using a LPCVD process.;

- The Si₃N₄ layer is etched to form sidewall spacers on the inside of the STI trench.;

- A SiO₂ layer (15) is grown on the Si₃N₄ layer using an HDPCVD process.; and

- The SiO₂ layer is cmp planarized down to the surface of the thermal oxide pad layer (16).

This is discussed in columns 1-4. This is shown in figures 2 A- 2 E.

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5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 4, 6, 8-9, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over En-Ho et. al. as applied in paragraph 3 above.

En-Ho et. al. As applied in paragraph 3 above fail to disclose the following aspects of applicant's claimed invention:

- the specific formation of the different layers to the specific thicknesses which are claimed by the applicant

It would have been obvious to one skilled in the art to form an STI trench with the specific aspect ratio which is claimed by the applicant based upon the following. It would have been desirable to form an STI trench with an aspect ratio such that the STI structure formed in the trench is sufficiently large to provide an adequate amount of

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insulation between adjacent devices on the surface of the wafer which are separated by the STI structure without consuming an excessive amount of expensive real estate on the wafer surface.

It would have been obvious to one skilled in the art to form the first dielectric to the specific thicknesses which are claimed by the applicant based upon the following. It would have been obvious to one skilled in the art to form the first insulating layer to a sufficient thickness to coat the bottom portion of the STI trench without forming the first insulating layer to an excessive thickness which would adversely affect production costs.

It would have been obvious to one skilled in the art to form the second dielectric to the specific thicknesses which are claimed by the applicant based upon the following. It would have been obvious to one skilled in the art to form the second insulating layer to a sufficient thickness to fill the STI trench without forming the second insulating film to an excessive thickness which would adversely affect production costs.

8. Claims 4, 7-9, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim as applied in paragraph 4 above.

Kim as applied in paragraph 4 above fail to disclose the following aspects of applicant's claimed invention:

- the specific formation of the different layers to the specific thicknesses which are claimed by the applicant

It would have been obvious to one skilled in the art to form an STI trench with the specific aspect ratio which is claimed by the applicant based upon the following. It

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would have been desirable to form an STI trench with an aspect ratio such that the STI structure formed in the trench is sufficiently large to provide an adequate amount of insulation between adjacent devices on the surface of the wafer which are separated by the STI structure without consuming an excessive amount of expensive real estate on the wafer surface.

It would have been obvious to one skilled in the art to form the first dielectric to the specific thicknesses which are claimed by the applicant based upon the following. It would have been obvious to one skilled in the art to form the first insulating layer to a sufficient thickness to coat the bottom portion of the STI trench without forming the first insulating layer to an excessive thickness which would adversely affect production costs.

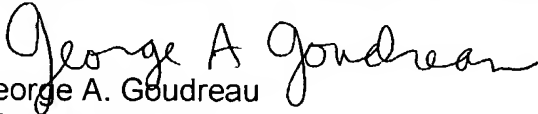
It would have been obvious to one skilled in the art to form the second dielectric to the specific thicknesses which are claimed by the applicant based upon the following. It would have been obvious to one skilled in the art to form the second insulating layer to a sufficient thickness to fill the STI trench without forming the second insulating film to an excessive thickness which would adversely affect production costs.

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

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10. Any inquiry concerning this communication should be directed to examiner

George A. Goudreau at telephone number (571)-272-1434.


George A. Goudreau
Primary Examiner
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